



Idaho Guidebook for Math and Science Educators

Making Content Accessible to English Learners

Idaho Guidebook for Math and Science Educators:

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Introduction

Every classroom has students with diverse learning needs and interests, and this diversity is increasing as more English learners enter our education system. English learners are themselves quite diverse — in their native language, level of English language development, prior experiences, and formal education. Like other students, English learners may prefer particular learning modalities and styles, may be designated for gifted and talented or special education services, or may have an innate bent for math or science. Since no single method works for all students, effective teachers continually explore and experiment with new ways to engage all students in successful learning. They learn to differentiate instruction to meet students “where they are” and to help them all achieve the same set of standards.

For all students, a large part of learning math and science content is learning the language of math and science and using the terminology meaningfully within academic conversations and written work. Understandably, students who are learning the English language at the same time as math or science need extra support to bridge the English they know to the academic content language they need to succeed. Both math and science are well suited to the instructional approach that works best for English learners — visual, hands-on, engaging, and interactive instruction.

This guidebook provides math and science teachers with clear ideas and concrete strategies that support English learners and capitalize on the visual and experiential aspects of teaching math and science content that are effective for all students. The guidebook offers a practical approach for integrating these strategies for English learners into lessons that address the diversity among all students as they construct new knowledge in their own ways.

We developed this guidebook with a focus on secondary math and science teachers who are looking for practical ways to help English learners in their classrooms understand the rigorous math and science content reflected in state standards. At the same time, we expect that teachers in elementary schools will find the guidebook’s strategies relevant and useful when planning lessons for math and science as well as other subject areas. The design of this guide is based on our assumption that many teachers in Idaho are at least somewhat familiar with a number of the ideas and strategies we present (e.g., SIOP¹), so explanations are kept brief, with references provided for those who wish to read in more depth about a specific topic.

This guidebook focuses on integrated content and language instruction for math and science teachers. This integrated approach, as described by Sherris, “is task-based and focuses on the knowledge, skills, and

1 Echevarria, J., Vogt, M., & Short, D.J. (2008). *Making content comprehensible for English learners: The SIOP model* (3rd Ed.). San Francisco: Pearson Education. The acronym “SIOP” stands for Sheltered Instruction Observation Protocol.

academic language within a content area. The academic language includes the concepts, key vocabulary, grammar, and discourse necessary to accomplish content-area tasks.”² One key principle is that the teacher plans both content and language objectives for each lesson.

The responsibility in a school for effectively teaching English learners needs to be shared among teachers, administrators, and support staff, who ideally collaborate on ways to integrate English language learning throughout the entire curriculum. We urge math and science teachers to work with English and English Language Development (ELD) teachers to build the academic language of the English learners they share. The English and ELD teachers can offer teaching suggestions, insights about particular students, and instructional help with specific language-related skills, such as note taking or report writing, that English learners must master in conjunction with math and science skills. Teachers and administrators in schools that do not have ELD specialists on staff may need to seek out collaboration from district, regional, or state consultants.

Finally, we encourage all teachers and administrators in a school to work together to provide a uniform, consistent instructional approach with core instructional strategies that work for all students, including English learners. Truly effective instruction that results in proficient high school graduates is a long-term, schoolwide, team effort.

² Sheris, A. (2008, September). Integrated content and language instruction. In *CALdigest*. Washington, DC: Center for Applied Linguistics. Accessed 12 November 2008. <<http://www.cal.org>>.

Section 1.

Inquiry-based Instruction and the English Learner

This section presents a general approach to teaching math and science that is especially effective for English learners. The approach is based on an inquiry model in which teachers combine brief direct instruction with activities that encourage English learners to talk about what they hear, see, and do as they explore and explain new concepts. There are two core underpinnings to this approach. First, English learners comprehend oral instruction better when it is accompanied by visuals. Second, English learners feel more comfortable and comprehend and express themselves better in structured, small group learning environments.

While effective math and science teachers are also language teachers, we recognize that most math and science teachers have not had extensive training in the pedagogy of English language arts or ELD. Therefore, our intent is to provide math and science teachers with clear ideas and concrete strategies that can be integrated into the planning and teaching of lessons for all students, while addressing the particular needs of English learners at the same time. In this section, we present some approaches and strategies that are effective for teaching all students, with explanations of how the approaches can benefit English learners.

Regardless of whether students are native English speakers or English learners, three research-based principles about how people learn³ guide effective math and science teaching and learning. These principles are the foundation of all of the ideas and strategies presented in this guidebook.

Principle 1: Connect to Students' Prior Knowledge and Engage Students' Preconceptions

All students come to the classroom with preconceptions about how the world works. If their initial understanding is not engaged, they may fail to grasp the new concepts and information that are taught, or they may learn them for purposes of a test but revert to their preconceptions outside the classroom.

English learners, like any learners, need a way to connect what they know from their experience and culture with what they need to learn.

3 National Research Council. (2005). *How students learn: History, mathematics, and science in the classroom*. Washington, DC: National Academies Press.

Principle 2: Ensure That Students Understand and Can Apply Knowledge

To develop competence in an area of inquiry, students must (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in ways that facilitate retrieval and application.

English learners, like any learners, need to learn facts and ideas and then relate and organize them conceptually.

Principle 3: Help Students Understand Their Own Learning

A metacognitive approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them.

English learners, like any learners, benefit from reflecting on their learning goals and progress. English learners, unlike native English speakers, will need to apply a metacognitive approach to learning English as well as to learning discipline-specific content such as math and science.

Teachers need to ensure that English learners have access to content knowledge — the facts, ideas, and concepts of math and science. Examples of some key strategies for making content accessible to all students, and that are especially recommended for English learners, are listed below.

USE VISUALS

Pictures, charts, graphs, and other visual materials can provide students with context and support for key math and science concepts in ways that require no or little language.

INCLUDE HANDS-ON ACTIVITIES

Direct involvement in such activities as carrying out a science experiment or manipulating geometric objects can help students to gain first-hand understanding of concepts that might require complex language to explain secondhand.

PROVIDE A RANGE OF READING MATERIALS

Access to texts at a range of readability levels allows students to choose the reading materials that they best comprehend. Students can then be challenged to try reading the same information in text at a higher readability level.

PROVIDE SCAFFOLDS FOR WRITING TASKS

Scaffolds for taking notes (e.g., graphic organizers, sentence starters) and writing reports (e.g., models, outlines) can help students organize and start writing tasks that they may not otherwise be able to complete independently.

PROVIDE OPPORTUNITIES FOR STUDENT TALK

Brief periods of direct instruction are interspersed with time for students to practice using target vocabulary in pairs or small groups during active learning tasks that require students to talk like a mathematician or scientist. Students can interact with each other while the teacher checks for understanding and guides individuals and groups of students as they construct and communicate new ideas.

Elements of Inquiry-based Instruction

Inquiry-based instruction is a teaching approach used in both math⁴ and science⁵ that is well suited for applying strategies that help English learners in the content classroom. This approach builds on students' previous knowledge and allows them to think critically and develop their own conclusions based on observations and investigations. The math or science teacher guides student learning: surfacing students' preconceptions — their prior knowledge and misconceptions — and tailoring the lesson accordingly; providing an engaging problem or phenomenon for students to explore; and connecting and organizing concepts into structures and themes.

What follows is a more in-depth presentation of the elements and stages in a unified approach to mathematics and science education. To do this, we draw from and adapt a specific approach from each discipline: the Idaho Math Initiative from mathematics, and the 5 Es from science.

First, the Idaho Math Initiative⁶ presents five elements of good teaching that focus on conceptual understanding while engaging students in solving real tasks.⁷ The five elements are slightly modified to fit both math and science:⁸

- **Focus on the Structure of the Content**

Knowledge of mathematics and science is structured with web-like or hierarchical relationships, or a combination of both, so lesson planning involves identifying and then making a network of related ideas clear to students;

4 Hawkins, B. (2005). Mathematics education for second language students in the mainstream classroom. In P. A. Richard-Amato & M. A. Snow (Eds.), *Academic success for English language learners* (pp. 377–397). White Plains, NY: Pearson Education, Inc.

5 Carrasquillo, A.L. & Rogríquez, V. (2005). Integrating language and science learning. In P. A. Richard-Amato & M. A. Snow (Eds.), *Academic success for English language learners* (pp. 377–397). White Plains, NY: Pearson Education, Inc.

6 Idaho State Department of Education. Accessed 14 October 2008, <http://www.sde.idaho.gov/site/math/math_initiative.htm>.

7 “Real” means a real-world problem or one that can be visualized by students (excludes contrived word problems).

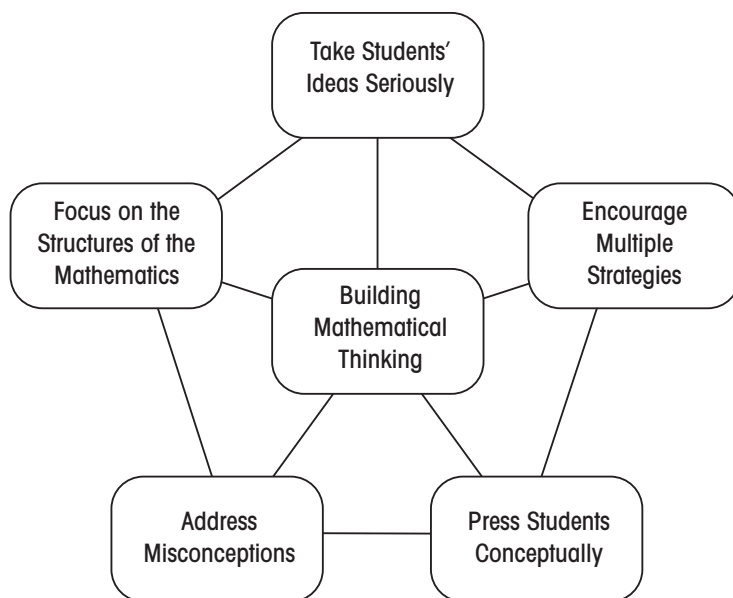
8 Brendefur, J. (2008). *DMT 5 big instructional ideas*. Center for Developing Mathematical Thinking. Accessed 20 October 2008, <<http://dmt.boisestate.edu>>. The graphic of the five ideas in Figure 1.1 is reproduced with permission from CDMT.

- **Take Students' Ideas Seriously**
When engaging students with a task, examine how they solved it and highlight their mathematical/scientific thinking;
- **Address Misconceptions**
Through exploring and explaining, students gather facts that do or do not support a prior claim, and thereby confront misconceptions as opportunities to restructure their knowledge in light of new information;
- **Press Students Conceptually**
The focus is on students' understanding and explanation of concepts rather than rote memorization of facts and rote application of procedures; and
- **Encourage Multiple Strategies**
Students compare and contrast alternative ways to solve a problem, investigate a phenomenon, or test a hypothesis.

As depicted in Figure 1.1, the five elements are intertwined and all focus on building mathematical thinking—the teacher moves back and forth among the five elements throughout a lesson as planned and in response to questions and answers expressed by students. As students discuss their ideas in small groups and whole class settings, the teacher guides their thinking.

Planning the lesson starts with identifying key concepts needed to solve real-world tasks or problems that engage students in the lesson topic (e.g., graphing equations). What are the content standards for this lesson? What is the connection among these concepts in this lesson? How are these concepts connected to prior and future lessons, for example, as students are expected to develop a hierarchical understanding of algebra? When planning the lesson, the teacher focuses on the structures of the mathematics or science.

Figure 1.1: Five Math Ideas

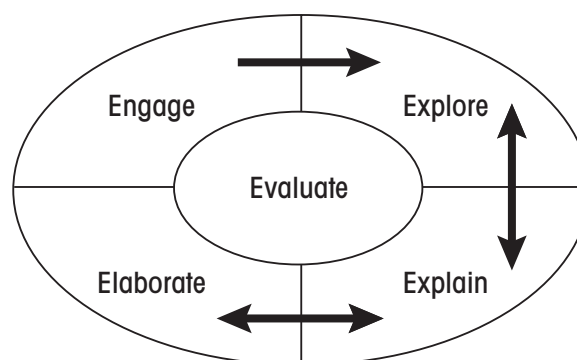


Adapted with permission from *DMT 5 Big Instructional Ideas*. © 2008 Center for Developing Mathematical Thinking (CDMT).

Teachers start the lesson by considering students' ideas about solving real-world problems.⁹ “What do you think” questions can be used to elicit students' prior knowledge and preconceptions about how to solve a new task or problem. Teachers allow students to create informal strategies, based on their prior knowledge, to solve a new problem, and then guide students to examine those strategies and develop more formal, standard strategies and algorithms. During the process of moving from informal to formal strategies, teachers must surface and then address students' misconceptions as they arise. Three ways to surface misconceptions are: encouraging students to use informal knowledge and experiences, probing with “why” questions, and checking for understanding (see Section 5) throughout the lesson.

Second, we present a popular approach from science education called the 5 Es¹⁰ that identifies stages of an inquiry-based lesson. The 5 Es involves a cycle of cognitive stages of student engagement, exploration, explanation, elaboration, and evaluation. As the arrows in Figure 1.2 suggest, the stages are not necessarily linear; there may be back and forth movement between certain stages, especially between explore and explain stages and between explain and elaborate stages. The evaluation stage spans the other four as students continually reflect on what they do and do not know, and teachers continually check for understanding and use the information to adjust their lessons. A description of each of the five stages and the teacher's role¹¹ follows.

Figure 1.2: The Five Es



Adapted from *Making Science Accessible to English Learners: A Guidebook for Teachers*. © 2007 WestEd.

Engage: Make connections between students' personal experience and background knowledge.

The teacher starts the learning process by involving students in making connections between their past and present learning experiences. This stage is meant to create interest, generate curiosity, and raise questions and problems through respectful consideration of students' prior experiences and ideas. This stage helps students engage in their own learning process while facilitating opportunities for the teacher to identify students' misconceptions. Any activity a teacher might use to engage students should be explicitly connected to content and standards in the unit lesson.

9 Brendefur, J. (2008, April). *The DMT instructional model: Implementing aspects of cognitively guided instruction, realistic mathematics education, and hypothetical learning trajectories in elementary school classrooms*. Unpublished manuscript. Boise: Center for Developing Mathematical Thinking (CDMT).

10 Bybee, R.W. (1997). *Achieving scientific literacy*. Portsmouth, NH: Heinemann. See pp. 176–181.

11 Vang, C. (2004). Teaching science to English learners. *Language Magazine*, 4(4). Adapted with permission of *Language Magazine*, <http://www.languagemagazine.com>.

Explore: Guide students through critical-thinking tasks or investigations.

The teacher guides students as they investigate or perform an experiment about a phenomenon and arrive at a common understanding of certain concepts, processes, and skills. The teacher designs activities that encourage students to construct new knowledge or skills, to propose preliminary predictions and hypotheses, to “puzzle” through problems, and to try alternatives to solve a challenging task.

Explain: Guide students through explaining their understanding.

The teacher guides students as they demonstrate or explain their conceptual understanding, process skills, or behaviors. They debate alternative explanations and contrast new facts with prior misconceptions. As appropriate, the teacher directs their attention to aspects of their earlier “engage” and “explore” experiences. Students organize information into evidence-based statements, using the academic language of the discipline.

Elaborate: Guide students through applying concepts to new contexts.

The teacher monitors activities and facilitates discussions that challenge and extend students’ conceptual understanding and skills. Students apply what they learned to new experiences to develop, extend, connect, and deepen their understanding.

Evaluate: Determine students’ progress and understanding.

The teacher evaluates students’ progress and students assess themselves throughout the other stages. Feedback may come from checking for understanding (for example, with hand gestures, white boards), quizzes, student discussions, or journals, to name a few techniques. The teacher uses the feedback to reflect on the effectiveness of the lesson, making mid-course adjustments to better fit the needs and interests of students. The students use the feedback to reflect on what they understand and what they still need to learn or want to know next.

To yield a unified approach to math and science education that benefits English learners, we embed the elements (from math education) within the stages (from science education) as follows. When planning a new unit of study, the teacher considers the structure or overarching concept that unites the many new concepts and connects to prior learned concepts. Meaningful small group and whole class activities involve students in observing, doing, discussing, reading, and writing. At the start of a lesson, the teacher *engages* students by eliciting preconceptions, taking their ideas seriously. During the lesson, the teacher addresses misconceptions as students pose conceptual answers during the *exploration* and *explanation* stages. A misconception is an opportunity to explore and reconcile old and new ideas. During the *elaboration* stage, the teacher often guides students to consider alternative ideas or make generalizations.

Section 2.

Using Academic Language Skills Charts to Tailor Instruction

This section presents charts of the most important listening, speaking, reading, and writing skills for English learners from the beginning to fluent stages of language development. There are four charts, one for each English Language Development (ELD) grade span: K–2, 3–5, 6–8, and 9–12. Their purpose is to help content teachers see at a glance what can be expected of their English learners and target instruction and assessment accordingly.

People do not learn either a first or second language all at once, but in stages — gradually increasing the use and comprehension of vocabulary and grammatical structures over time. This section show how math and science teachers can apply their understanding of the stages of second language acquisition to help English learners access the academic language required in the math and science classroom.

How can math and science teachers ensure that their English learners have equal access to the content knowledge represented in the math and science content standards? One way is to understand English learners' communication abilities as they progress from beginners to fluent speakers with grade-level language and literacy skills. The progression of communication skills in English is represented by Idaho's five ELD levels, as shown in the chart to the right.

5 ELD Levels

1 Beginning

2 Advanced
Beginning

3 Intermediate

4 Early Fluent
5 Fluent

Idaho's ELD standards (specifically, the objectives for each standard) describe the content and skills that English learners know and can do at each of the five levels — Beginning, Advanced Beginning, Intermediate, Early Fluent, and Fluent. The ELD standards are clearly linked to the English language arts standards.¹² However, math and science teachers need to understand and apply only a subset of ELD standards — those that describe the most important academic language skills for providing English learners access to the math and science curriculum. The Academic Language Skills (ALS) charts presented in this section summarize that subset of ELD standards in a format that can serve as a bridge for content teachers between the full set of ELD standards and the discipline-specific academic content standards.

The ALS charts address the language domains of listening, speaking, reading, and writing. The charts for grades K–2 and 3–5 include six language skills, and the charts for grades 6–8 and 9–12 include seven language skills. An additional skill in each chart, Communicating Critical Thinking, identifies the level of critical thinking that English learners can be expected to *communicate* in English. All English learners have the capacity to think critically, though their ELD level may affect their ability to express their thinking in English.

¹² ELD standards can be accessed at <http://www.sde.idaho.gov/ContentStandards/lepstandards.asp>, in a document titled *The Idaho Map of Standards for English Learners*.

Academic Language Skills Grades K–2					
Skill	Beginning	Advanced Beginning	Intermediate	Early Fluent	Fluent
Listen with Comprehension	Follow one-step directions. Use gestures or words to identify a key idea of very brief, concrete information presented orally with visual support.	Follow two-step directions. Use a few words to identify a few key ideas of brief, mostly concrete information presented orally with visual support.	Follow simple multi-step directions. Use simple sentences to identify a few key ideas of concrete and some abstract information presented orally with some visual support.	Follow multi-step directions. Use coherent sentences to identify key ideas of information presented orally.	Same as early fluent.
Use Academic Vocabulary	Identify common, simple antonym pairs (e.g., hot/cold). Use basic social vocabulary and a few academic vocabulary words to communicate basic meaning.	Identify common, simple antonyms and synonyms. Use more social and some academic vocabulary words and phrases to communicate meaning.	Identify common antonyms and synonyms. Share information orally using simple sentences that contain a few academic words.	Identify and use common antonyms and synonyms to determine the meaning of words. Share information orally using coherent sentences that contain some academic vocabulary.	Identify and use common antonyms and synonyms to determine the meaning of words. Retell information presented orally using coherent sentences that contain academic vocabulary.
Ask and Answer Questions	Orally ask and answer familiar, very simple factual questions using words or phrases.	Orally ask and answer simple factual questions using a few words or phrases.	Orally ask and answer factual questions using simple sentences.	Ask and answer factual and simple inferential questions.	Same as early fluent.
Read with Comprehension	Respond to prompting about an experience using gestures or words orally. Identify the topic in brief text by drawing a picture using gestures or words orally.	Tell a brief experience using words and phrases in response to prompts. Identify the topic in brief text by drawing a picture and using phrases orally.	Tell an experience in a logical sequence using phrases and simple sentences with some prompting. Orally identify the topic in text by using simple sentences.	Tell an experience in a logical sequence using simple sentences without prompting. Orally identify the topic in text and sequence information in a logical order.	Tell an experience in a logical sequence using detailed sentences without prompting. Orally identify the topic in text and sequence information in a logical order.

Academic Language Skills Grades K–2 <i>(continued)</i>					
Skill	Beginning	Advanced Beginning	Intermediate	Early Fluent	Fluent
Use Writing Strategies	Draw a picture for a given topic.	Label a series of pictures or fill in a simple prewriting organizer for a given topic with support, using familiar words and phrases.	For grades 1–2, fill in a prewriting organizer and, with support, write a draft of a few simple sentences that includes a main idea; edit for beginning capitalization and ending punctuation.	For grades 1–2, fill in a prewriting organizer, write a draft that includes a main idea and some details, make basic revisions, and edit for some writing conventions.	For grades 1–2, fill in a prewriting organizer, write a draft that includes a main idea and details, make revisions, and edit for grade-level writing conventions.
Write Reports	Draw and label a picture and respond to oral prompts about observations of real objects, persons, places, events, or processes using words or phrases.	Draw and label a series of pictures and respond to oral prompts about observations of real objects, persons, places, events, or processes using phrases.	For grades 1–2, write brief explanations of observations of real objects, persons, places, events, or processes using a sentence starter template with prompting.	For grades 1–2, write brief explanations of observations of real objects, persons, places, events, or processes using a few simple sentences.	For grades 1–2, write brief explanations of observations of real objects, persons, places, events, or processes using more detailed sentences.
Communicate Critical Thinking	Compare and contrast, using gestures or a few words. Identify simple sequential or chronological order Identify conclusions.	Compare and contrast, using a few words or phrases. Identify sequential or chronological order. Recognize cause and effect relationships. Make predictions.	Compare and contrast, using simple sentences. Identify sequential or chronological order. Recognize cause and effect relationships. Make and confirm predictions.	Compare and contrast, using more detailed sentences. Identify sequential or chronological order. Recognize cause and effect relationships. Make and confirm predictions.	Same as early fluent.

Academic Language Skills Grades 3–5					
Skill	Beginning	Advanced Beginning	Intermediate	Early Fluent	Fluent
Listen with Comprehension	Follow simple one-step oral directions. Show understanding by using words or phrases to identify literal concepts in very brief, simple information presented orally with visual support.	Follow simple two-step oral directions. Use phrases and simple sentences to identify the main idea and a few important details in brief, simple information presented orally with visual support.	Follow simple multi-step oral directions. Briefly describe the main idea and some important details of information presented orally with visual support.	Listen to and follow multi-step directions. Describe the main idea and many of the important details of information presented orally near grade level.	Listen to and follow multi-step directions. Describe the main idea and important details of information presented orally at grade level.
Use Academic Vocabulary	Identify common, simple antonym pairs (e.g., hot/cold). Use basic social vocabulary and a few academic vocabulary words in phrases to communicate basic meaning.	Identify common antonyms and synonyms. Determine the meaning of words using knowledge of common base words, and a few simple prefixes and suffixes. Use more social and some academic vocabulary words in sentences to communicate meaning.	Identify and use common antonyms, synonyms, and words with multiple meanings. Determine the meaning of words using knowledge of common roots, prefixes, and suffixes. Use expanded academic vocabulary to express simple ideas.	Identify and use antonyms, synonyms, and words with multiple meanings. Determine the meaning of most words using knowledge of common roots, prefixes, and suffixes. Use expanded academic vocabulary to express ideas near grade level.	Identify and use antonyms, synonyms, and words with multiple meanings. Determine the meaning of words using knowledge of various roots, prefixes, and suffixes. Use academic vocabulary to express ideas at grade level.
Ask and Answer Questions	Orally ask and answer very simple factual comprehension questions using words or phrases.	Orally ask and answer simple factual comprehension questions using phrases or simple sentences.	Ask and answer factual and some simple inferential comprehension questions using more detailed sentences.	Ask and answer factual and inferential comprehension questions using detailed sentences.	Same as early fluent.
Read with Comprehension	Orally identify some facts in simple text with visuals read aloud.	Read a brief, simple text with support. Orally identify some facts and retell in logical order; draw conclusions.	Read text at independent reading level. Orally identify main ideas and some important details; draw conclusions and locate some evidence in the text.	Read near grade-level text. Identify main ideas and summarize important information; draw conclusions and locate evidence in the text.	Read at grade-level text. Identify main ideas and summarize important information; draw conclusions and locate evidence in the text.

Academic Language Skills Grades 3–5 <i>(continued)</i>					
Skill	Beginning	Advanced Beginning	Intermediate	Early Fluent	Fluent
Use Writing Strategies	Organize basic information by drawing and labeling a sequence of pictures or graphic organizer; and fill in sentence frames to express key ideas.	Organize basic information and complete a graphic organizer; write a series of short sentences; and use a simple editing checklist.	Organize more detailed information; write a brief paragraph using a template and revise for meaning; and use a simple editing checklist.	Organize more complex information; write a draft and revise for meaning and clarity; and use a modified grade-level editing checklist.	Organize more complex information; write a draft and revise for meaning and clarity; and use a grade-level editing checklist.
Write Reports	Label graphic organizers using key words and phrases, and complete sentence frames or dictate sentences.	Write an increasing number of words, phrases, and simple sentences using sentence frames.	Write paragraphs using a template with some sentence frames that express key concepts and some supporting details.	Using a template, write a brief report that focuses on a main idea with important details using more detailed sentences.	Write a report that focuses on a main idea with important details using detailed sentences.
Communicate Critical Thinking	Compare and contrast, using gestures or a few words. Identify simple sequential or chronological order.	Compare and contrast, using phrases or simple sentences. Identify sequential or chronological order. Distinguish between fact and opinion. Identify cause and effect relationships. Make predictions, and draw simple conclusions.	Compare and contrast, using more detailed sentences. Describe sequential or chronological order. Distinguish between fact and opinion. Briefly describe cause and effect relationships. Make and confirm predictions, draw conclusions, and make generalizations.	Compare and contrast, using detailed sentences. Analyze sequential or chronological order. Distinguish between fact and opinion. Describe cause and effect relationships. Make and confirm predictions, draw conclusions, and make inferences and generalizations.	Same as early fluent.

Academic Language Skills Grades 6–8					
Skill	Beginning	Advanced Beginning	Intermediate	Early Fluent	Fluent
Listen with Comprehension	Follow simple one-step oral directions. Use phrases and simple sentences to identify literal concepts in very brief, simple information presented orally with visual support.	Follow simple two-step oral directions. Use more detailed sentences to identify the main idea and a few important details in brief, simple information presented orally with visual support.	Follow simple multi-step oral directions. Briefly describe the main idea and some important details of information presented orally with visual support.	Follow multi-step oral directions. Summarize the main idea and many important details of information presented orally.	Follow multi-step oral directions. Summarize the main ideas and important details of information presented orally.
Use Academic Vocabulary	Identify common, simple antonym pairs (e.g., hot/cold). Use basic social vocabulary and a few academic vocabulary words in phrases and simple sentences to communicate basic meaning.	Identify common antonyms and synonyms. Use context to understand some unknown words and words with multiple meanings. Use more social and some academic vocabulary words in more detailed sentences to communicate meaning.	Use glossary, knowledge of some word parts, and context to understand some unknown words and words with multiple meanings in text at an independent reading level. Use expanded academic vocabulary to express simple ideas.	Use knowledge of word parts and context as well as dictionary to understand unknown words and words with multiple meanings in near grade-level text. Use expanded academic vocabulary to express complex ideas.	Use knowledge of word parts and context as well as dictionary to understand unknown words and words with multiple meanings in grade-level text. Use expanded academic vocabulary to express complex ideas.
Ask and Answer Questions	Orally ask and answer very simple factual comprehension questions using phrases and simple sentences.	Orally ask and answer factual comprehension questions using more detailed sentences.	Ask and answer factual and simple inferential comprehension questions.	Ask and answer factual and inferential comprehension questions.	Same as early fluent.
Read with Comprehension	Read a brief, very simple text with visuals and assistance. Identify a main idea and a few details, using oral phrases and simple sentences.	Read a brief, simple text with visuals and assistance. Identify a main idea and some important details, using more detailed oral sentences or in writing using sentence frames.	Read text at independent reading level. Summarize the literal or inferential main idea and some important details orally or in writing using some sentence starters.	Read near grade-level text, or grade-level text with some assistance. Summarize the literal and inferential main ideas and important details.	Read grade-level text. Summarize the literal or inferential main ideas and important details from grade-level text.

Academic Language Skills Grades 6–8 <i>(continued)</i>					
Skill	Beginning	Advanced Beginning	Intermediate	Early Fluent	Fluent
Take Notes	Take very basic notes by labeling pictures and using sentence frames to write a few words about key information from an investigation, brief lecture, or very simple written text.	Take basic notes by labeling pictures and using sentence frames to write words and phrases about key information and some important details from an investigation, brief lecture, or simple written text.	Take notes by using some sentence starters about key information and important details from an investigation, brief lecture, or written text at independent reading level.	Take notes about key information and important details from an investigation, brief lecture, or written text.	Same as early fluent.
Use Writing Strategies	Organize basic information by drawing and labeling a sequence of pictures or graphic organizer; and fill in sentence frames to express key ideas.	Organize basic information; write a series of short sentences by following a template; and use a simple editing checklist.	Organize more detailed information; write one or two brief paragraphs by following a template; and use a simple editing checklist.	Organize more complex information; write a draft; revise for meaning and clarity; and use a modified grade-level editing checklist.	Organize complex information; write a draft; revise for meaning and clarity; and use a grade-level editing checklist.
Write Reports	Write simple expository sentences using sentence frames that include some facts.	Write a series of simple sentences using sentence frames that include some facts and details.	Write a brief report with more complex sentences using a template that includes facts, details, and examples, aided by a template.	Write a longer report that focuses on a main idea with some important details and examples.	Write a full-length report that focuses on a main idea with important details compiled through a formal research process.
Communicate Critical Thinking	Compare and contrast. Identify cause and effect and sequential order relationships. Identify facts and opinions. Form basic hypotheses and conclusions.	Compare and contrast. Identify cause and effect and sequential order relationships. Distinguish between fact and opinion. Hypothesize and conclude.	Compare and contrast. Describe cause and effect and sequential order relationships. Distinguish between fact and opinion. Hypothesize, infer, generalize, and conclude.	Compare and contrast. Analyze cause and effect and sequential order relationships. Distinguish among fact, opinion, and supported inferences. Hypothesize, infer, generalize, and conclude.	Compare and contrast. Analyze cause and effect and sequential order relationships. Identify relative credibility of information. Hypothesize, infer, generalize, and conclude.

Academic Language Skills Grades 9–12					
Skill	Beginning	Advanced Beginning	Intermediate	Early Fluent	Fluent
Listen with Comprehension	Follow simple one-step oral directions. Use phrases and simple sentences to identify literal concepts in simple information presented orally with visual support.	Follow simple two-step oral directions. Use more detailed sentences to briefly describe the main idea and a few supporting details in simple information presented orally with visual support.	Follow simple multi-step oral directions. Describe the main idea and some important details of information presented orally with visual support.	Follow multi-step oral directions. Summarize major ideas and supporting details of information presented orally.	Same as early fluent.
Use Academic Vocabulary	Identify common, simple antonym pairs (e.g., hot/cold). Use basic social vocabulary and a few academic vocabulary words in phrases and simple sentences to communicate basic meaning.	Identify common antonyms and synonyms. Use context to understand some unknown words and words with multiple meanings. Use more social and some academic vocabulary words in more detailed sentences to communicate meaning.	Use glossary, knowledge of some word parts, and context to understand some unknown words and words with multiple meanings in text at independent reading level. Use expanded academic vocabulary to express simple ideas.	Use knowledge of word parts and context as well as dictionary to understand unknown words and words with multiple meanings in near grade-level text. Use expanded academic vocabulary to express complex ideas.	Use knowledge of word parts and context as well as dictionary to understand unknown words and words with multiple meanings in grade-level text. Use expanded academic vocabulary to express complex ideas.
Ask and Answer Questions	Orally ask and answer simple factual comprehension questions using phrases or simple sentences.	Orally ask and answer factual comprehension questions using more detailed sentences.	Ask and answer factual and simple inferential comprehension questions.	Ask and answer factual and inferential comprehension questions.	Same as early fluent.
Read with Comprehension	Read a brief, very simple text with visuals and assistance. Identify a main idea and a few details, using oral simple sentences.	Read a brief, simple text with visuals and assistance. Identify a main idea and some important details, using more detailed oral sentences or in writing using sentence frames.	Read text at independent reading level. Summarize the literal or inferential main idea and some supporting details orally or in writing using sentence frames.	Read near grade-level text, or grade-level text with some assistance. Summarize the literal and inferential main ideas and supporting details.	Read grade-level text. Summarize the literal or inferential main ideas and supporting details from grade-level text.

Academic Language Skills Grades 9–12 <i>(continued)</i>					
Skill	Beginning	Advanced Beginning	Intermediate	Early Fluent	Fluent
Take Notes	Take very basic notes by labeling pictures and using sentence frames to write a few words about key information from an investigation, brief lecture, or very simple written text.	Take basic notes by labeling pictures and using sentence frames to write words and phrases about key information and some important details from an investigation, brief lecture, or simple written text.	Take notes by using some sentence starters about key information and important details from an investigation, brief lecture, or written text at independent reading level.	Take notes about key information and important details from an investigation, brief lecture, or written text.	Same as early fluent.
Use Writing Strategies	Organize basic information by drawing and labeling a sequence of pictures or graphic organizer; and fill in sentence frames to express key ideas.	Organize basic information; write a series of short sentences by following a template; and use a simple editing checklist.	Organize more detailed information; write one or two brief paragraphs by following a template; and use a simple editing checklist.	Organize more complex information; write a draft; revise for meaning and clarity; and use a modified grade-level editing checklist.	Organize complex information; write a draft; revise for meaning and clarity; and use a grade-level editing checklist.
Write Reports	Write simple expository sentences using sentence frames.	Write a series of simple sentences using sentence frames that include a main idea and some important details.	Write a brief report with more complex sentences using a template that includes a main idea and important details.	Write a longer report that includes a main idea and important details.	Write a full-length report that includes a main idea and explains the significance of specific data, facts, and ideas.
Communicate Critical Thinking	Compare and contrast. Identify cause and effect and sequential order relationships. Identify facts and opinions. Form basic hypotheses and conclusions.	Compare and contrast. Identify cause and effect and sequential order relationships. Distinguish between fact and opinion. Hypothesize and conclude.	Compare and contrast. Analyze cause and effect and sequential order relationships. Distinguish among fact, opinion, and supported inferences. Hypothesize, infer, generalize, and conclude.	Compare and contrast. Analyze cause and effect and sequential order relationships. Identify relative credibility of factual information. Hypothesize, infer, generalize, and conclude.	Same as early fluent.

Using the Academic Language Skills Charts

The ALS charts can be used for two major purposes: (1) determining English learners' initial ELD proficiency level; (2) planning instruction and assessment that matches English learners' communication abilities. There are three steps for planning inclusive lessons using the ALS charts. These two purposes and three steps are described below.

Determining Students' Initial Language Level

Often, the only English language proficiency assessment data available to teachers are state test scores. State test data may be both too general and too old for usefulness in guiding instruction. When accurate information about English learners' language proficiency is not available, a math or science teacher can observe and interact with individual students and use the appropriate grade span chart to judge the students' language skill levels.

Planning Instruction and Assessment

Teachers can use the ALS charts as a guide to plan strategies, materials, and activities that scaffold learning for students at different English proficiency levels. After planning the lesson for the whole class, the teacher can consult the ALS chart and enhance the lesson plan with scaffolds for English learners at different proficiency levels.

Providing access to English learners is not a matter of “dumbing down” the curriculum; rather, teachers use strategies to scaffold grade-level academic content learning for English learners (see Section 4). English learners have the capacity to engage in higher-order thinking; their challenge comes with understanding instruction in English and communicating that thinking in English, particularly at the lower proficiency levels.

STEP 1: PLAN THE CONTENT LESSON

The teacher plans a unit lesson, grounded in inquiry-based instruction (Section 1) and embedding many strategies for building vocabulary (Section 3), strategies for teaching content to English learners in general (Section 4), and strategies or accommodations for assessing English learners (Section 5). Complete math and science sample outlines of lessons incorporating the information in Sections 1–5 are presented in Section 6.

STEP 2: DETERMINE THE NEEDS OF ENGLISH LEARNERS

The teacher consults the ALS charts to see which instructional strategies should be adjusted to fit the communication skill levels of the English learners in the class.

STEP 3: ENHANCE THE CONTENT LESSON FOR ENGLISH LEARNER ACCESS

The teacher enhances the lesson plan by “zooming in” on the language needs of the English learners. To do this, the teacher modifies certain strategies and expectations of student performance, guided by the descriptors in the ALS charts. The teacher might create a brief, modified ALS chart as part of a unit lesson plan.

Sometimes, students at adjacent proficiency levels may be grouped for differentiated instruction. For example, English learners at the Beginning and Advanced Beginning levels may be given one set of sentence frames for taking notes with intensive support, while English learners at the Intermediate and higher levels are given a different set of sentence frames with less intensive or other types of support.

Similarly, Beginning and Advanced Beginning English learners may be offered alternative reading texts at a lower level (using very controlled vocabulary within brief illustrated text), Intermediate English learners may be offered relatively brief texts closer to grade level, and English learners at higher levels are expected to read the course textbook and other grade-level texts. English learners at the Fluent level, and perhaps the Early Fluent level, can often be grouped with native English-speaking students when the teacher provides scaffolding strategies that benefit all diverse learners.

Examples of ALS Charts Applied to a Lesson Plan

Modified ALS Chart for Algebra 1 Lesson

This example is one part of an Algebra I lesson plan in which students are expected to graph an equation based on ordered pairs in a table to predict cell phone charges for calls of different lengths. After planning general instructional strategies for the whole class, the teacher refers to the grades 9–12 Academic Language Skills (ALS) chart to modify certain strategies so they fit the needs of English learners at different language levels. Figure 2.1 shows the adaptation of the ALS chart for this lesson.

Figure 2.1: ALS Chart for Algebra 1 Lesson

Example of Grades 9–12 ALS Chart Applied to a Math Lesson			
Academic Language Skills	Beginning/Advanced Beginning	Intermediate	Early Fluent
Use Academic Language	Use key words and informal definitions from the Word Wall during group activities and class discussion.		Use expanded vocabulary to express complex ideas. Use word parts, glossary, and dictionary to define new words.
Ask and Answer Questions	Orally ask and briefly answer factual questions.	Orally ask and answer factual questions.	Ask and answer any questions, orally or in writing.
Take Notes	Use template created for all students (very little writing is required).		
Read with Comprehension	Read simple texts with assistance.	Read directions; read general texts; may need assistance.	

Other notes in the teacher's unit lesson plan identify differentiation for levels of English learners as follows.¹³

- During the graphing task, have English learners at the B/AB levels work in pairs with a more English-fluent student. Model “working together” beforehand so one student does not dominate the interaction or give answers to the others.
- For B/AB/I students, simplify wording and add illustrations to the directions for the graphing task. Point to Word Wall when using key words.
- Ask the same factual questions of B/AB/I students, but expect more expanded answers at higher levels. Expect EF/F students to understand and answer more detailed questions about analysis and prediction. Provide simple written directions with pictures on the student worksheets for B/AB students.
- Read the textbook section, paraphrasing in simple sentences and “think aloud” for the whole class. When rereading the textbook section, more English literate students may help B/AB and perhaps some I students. Pair English learners with native English speakers to read and discuss.
- Monitor student work groups and pull aside any students who are having difficulties for more intensive assistance.

Modified ALS Chart for Science Lesson

This example is one part of a sixth grade life science lesson in which the teacher starts by modeling a house as a system, and then has students practice by using a system familiar to them in order to complete a task about the human organism as a system.

¹³ ELD levels are abbreviated (B = Beginning, AB = Advanced Beginning, I = Intermediate, EF = Early Fluent, F = Fluent).

Figure 2.2: ALS Chart for Science Lesson

Example of Grades 6–8 ALS Chart Applied to a Science Lesson			
AL Skills	Beginning/Advanced Beginning	Intermediate	Early Fluent/Fluent
Listen	Follow simple two-step oral directions with visuals.	Follow simple multi-step oral directions.	Follow multi-step directions.
Use Academic Language	Use some key words from Word Wall during Think-Pair-Share and small group tasks.	Use key words from Word Wall, KWL+, and texts during Think-Pair-Share, small group tasks, and whole class discussion.	Use expanded vocabulary to express complex ideas. Use word parts, glossary, and dictionary to define new words.
Ask and Answer Questions	Orally ask and answer factual questions.	Make a simple inference about familiar and human systems.	Ask and answer any analytical and inferential questions.
Take Notes	Complete a T-chart in a group to identify parts of a system during the investigation task.	Complete a T-chart and template with sentence starters during the investigation.	Complete a T-chart template to take detailed notes during the investigation.
Read with Comprehension	Read content of KWL. Read Scholastic (grade 2) “The Digestive System.” Contribute in small group.	Read Scholastic (grade 4) “The Circulatory System.” Contribute in small group.	Read textbook on organism systems. Consolidate information.
Writing Strategies	Help organize basic facts in the group posters.	Help organize facts and details in the group posters.	Coordinate poster work, and add complex information.
Write Reports	Illustrate and label posters. Complete sentence frames about the human system.	Contribute to group poster. Write a brief report using a template that includes a simple inference.	Write a longer report using a template that includes explanations and inferences.

Other notes in the teacher’s unit lesson plan identify differentiation for levels of English learners as follows:

- Modify directions for the investigation task for B/AB students, using simple phrases with pictures.
- B/AB students read Scholastic’s “The Digestive System” (second grade readability level) in pairs; I students read Scholastic’s “The Circulatory System” (fourth grade readability level) in pairs; and EF/F English learners read excerpts from the textbook in pairs with other students.
- Mixed ELD levels assign cooperative tasks for creating group posters.
- Give B/AB students a writing template with supportive sentence frames. Give I students sentence frames with function words (see Section 3) that guide expression of more complex, interrelated concepts.

Linkage of Math and Science Standards to ELD Standards

Math and science standards typically describe facts and concepts that students should know, along with some general descriptions of how students need to communicate this knowledge (e.g., “Explain...”). ELD standards, on the other hand, typically describe skills specific to the four language modalities of listening, speaking, reading, and writing. The linkage between ELD standards and math or science standards is thus necessarily “many-to-one.” In other words, students will typically engage in a variety of listening, speaking, reading, and writing skills to learn or demonstrate understanding of any given math or science standard. The examples in the table below show two similar math and science standards (“Explain how...”) and their linkage to a common set of ELD objectives.

Sample Content Objectives	Linked ELD Objectives Level 5: Fluent			
Math (Grade 7) 7.M.3.1.1 Explain how a change in one quantity impacts a change in another quantity.	Listening ELD 1.1.3 Summarize main ideas and supporting details of information presented orally at grade level.	Speaking ELD 2.1.2 Summarize major ideas and supporting details.	Reading ELD 3.2.2 Summarize the literal and inferential main ideas and critical details from grade-level text. ELD 3.2.3 Make inferences, draw conclusions, form opinions, and locate evidence in grade-level text.	Writing ELD 4.1.1 Apply the writing process to: organize ideas and select an appropriate format; write a draft; revise for meaning and clarity; and use a grade-level editing checklist.
Science (Grade 6) 6.S.1.2.1 Explain how observations and data are used as evidence on which to base scientific explanations and predictions.				

Section 3.

Teaching Academic Vocabulary

This section describes the use of a variety of tools and strategies that assist English learners to build necessary academic vocabulary and apply newly learned academic language orally and in writing. The sample lesson plans in Section 6 include examples of integrating the teaching of vocabulary for English learners.

Function Words and Sentence Starters

Function words and phrases are the necessary connectors for relating ideas and signaling their organization. Native English speakers learn them naturally along with other aspects of the language. For English learners, explicit instruction must be planned to help them master these terms. The teacher models the use of function words before students apply them in small group discussion. Many of the words or phrases can be used as “sentence starters,” while some connect ideas inside a sentence. They can be provided to English learners on posters to support oral language and in sentence frames to support written communication. Figure 3.1 below presents a variety of common function words used in mathematics and science.

Figure 3.1: Function Word List

Function Words to Connect and Communicate Ideas			
Giving a definition	is equal to	means	refers to
	is the same as	in other words	consists of
Providing an example	for example	is like	such as
	including	to illustrate	
Adding more ideas	in addition	also	another
Sequencing	first ... second	next	before, initially
	on, by (date)	when	after, finally
Comparing	same as	similarly	in comparison
Contrasting	different from	but	in contrast
Showing cause and effect relationships	because	as a result of	if ... then
	in order to	for this reason	since
Describing problems and solutions	the problem is	the question is	one reason is
	a solution is	one answer is	
Expressing an opinion or conclusion	I think	I predict that	I deduce that
	I conclude that	I hypothesize that	in my opinion
Reporting findings or outcomes	I observed that	I learned that	I discovered that

Adapted with permission from *English Learners and the Language Arts (ELLA)*, San Francisco: WestEd, 2003.

English learners, particularly below the intermediate proficiency level, may be unsure about the meaning and use of function words or the general language to discuss ideas, such as asking a question and agreeing or disagreeing with someone’s idea. Figure 3.2 presents sets of discussion sentences or sentence starters¹⁴ that can be enlarged as laminated placards and posted on the wall or hung from the ceiling.

Figure 3.2: Discussion Sentence Starters

Predicting <i>I guess/predict/imagine that...</i> <i>Based on..., I infer that...</i> <i>I hypothesize that...</i>	Expressing an Opinion <i>I think/believe that...</i> <i>In my opinion...</i> <i>It seems to me that...</i> <i>Based on my experience, I think...</i>
Asking for Clarification <i>What do you mean?</i> <i>Will you explain that again?</i> <i>How did you find your answer?</i>	Paraphrasing <i>So you are saying that...</i> <i>In other words, you think...</i> <i>What I hear you saying is...</i>
Soliciting a Response <i>What do you think?</i> <i>We haven’t heard from you yet.</i> <i>Do you agree?</i> <i>What is your answer?</i>	Acknowledging Ideas <i>My idea is similar to/related to ___’s idea.</i> <i>I agree with ___ that...</i> <i>My idea builds upon ___’s idea.</i>
Affirming <i>That’s an interesting idea.</i> <i>I hadn’t thought of that.</i> <i>I see what you mean.</i>	Holding the Floor <i>As I was saying...</i> <i>If I could finish my thought...</i> <i>What I was trying to say was...</i>
Reporting a Partner’s Idea <i>___ shared with me that...</i> <i>___ pointed out to me that...</i> <i>___ emphasized that...</i> <i>___ concluded that...</i>	Reporting a Group’s Idea <i>We decided/agreed that...</i> <i>We concluded that...</i> <i>Our group sees it differently.</i> <i>We had a different approach.</i>
Disagreeing <i>I don’t agree with you because...</i> <i>I got a different answer than you.</i> <i>I see it another way.</i>	Offering a Suggestion <i>Maybe we could...</i> <i>What if we...</i> <i>Here’s something we might try.</i>

Adapted with permission of Kate Kinsella.

¹⁴ Adapted from *Language Strategies for Active Classroom Participation* (June 2007) with permission from Kate Kinsella. The document can be accessed as LanguageClassDiscussion.doc at <<http://www.sccoe.org/depts/ell/kinsella.asp>>. This webpage also lists many other “open access” documents that Kate Kinsella presents in her workshops.

Four Steps for Teaching Vocabulary

Step 1. Identify Vocabulary All Students Need to Know

Identify the key academic vocabulary (words and phrases) all students need to know. Then identify key content or function words that English learners at different levels will need to know. To avoid an unreasonably long list of words, limit the list to “high need” vocabulary and define other words casually and quickly when students point out those they do not know. Selecting or modifying texts that students will read and carefully choosing what to say during oral instruction can avoid frustrating English learners with too many unknown words and idioms.

Step 2. Plan When to Teach Vocabulary

Plan which words to teach at the *beginning* of a lesson, *during* oral instruction or learning activities, or as a *concluding* activity. At the beginning of a lesson, introduce a few key new words while activating prior knowledge using the KWL strategy (see Section 4); this is known as front-loading vocabulary. During a lesson, introduce new words while showing what they mean during a lesson, such as when performing an experiment or graphing an equation. Last, teach certain new words at the conclusion of a lesson. The teacher may introduce new target words, often synonyms of words used earlier in the lesson, during the explanation phase of a lesson when the whole class is discussing what they learned. In this way, students concentrate on exploring new concepts using known vocabulary and later attach new vocabulary words to these concepts.

Step 3. Build from Informal to Formal Definitions

Particularly for new vocabulary introduced early in the lesson, start with an informal or student-generated definition along with helpful pictures or examples. As the lesson progresses, revisit key vocabulary and establish a formal academic definition as students build more sophisticated knowledge about a concept. Keep the new vocabulary with definitions and examples visible, such as on a Word Wall.

Step 4. Plan Many Opportunities to Apply Key Vocabulary

Students need many opportunities in class discussions, small group discussions, and writing to hear, see, repeat, and apply key terms to deepen and sustain their understanding. Consciously reuse and emphasize key words (e.g., pausing, saying the word slightly louder, or pointing to the word on a Word Wall). Using a vocabulary routine helps English learners focus on the words instead of the teaching procedure. Identify other words with the same word parts as a way to reinforce words with similar meanings.

The teacher should consider whether or not to encourage students to apply new academic vocabulary during small group talk. It depends on when it is appropriate to introduce specific words (or terms). The purpose of small group talk is typically for the students to feel comfortable and capable sharing ideas and to understand what their peers are saying. The teacher might wait until later in the lesson — after vocabulary has been well defined and repeatedly used — to encourage students to apply new academic words.

Three Instructional Strategies

Next, three instructional strategies are presented that support learning and applying key vocabulary.

1. Word Wall. A Word Wall is a list of new vocabulary in alphabetical order or presentation order. An enhanced Word Wall adds brief definitions.

A Word Wall keeps key vocabulary visible as a reference throughout a lesson as English learners hear, read, and write the words. Words are added as they are introduced in a lesson. Examples, synonyms, or pictures may be used to define a term. Adding the part of speech (noun, verb, adjective, adverb) can help English learners correctly apply new words (e.g., calculate (v.), or calculator (n.)). Including several of these defining features is akin to embedding a concept organizer (see third strategy presented below) in a Word Wall.

New terms and their definitions may be written on paper strips or large index cards and placed in a pocket chart. Later in a lesson, terms might be organized into categories, or their definitions can be mixed up and students must correctly match terms and definitions as a reinforcement activity.

It is a good idea for English learners to have new vocabulary with definitions in their notebooks for use when they complete homework such as reading and writing assignments out of the classroom.

2. Sentence Frames. A sentence frame provides part of a sentence with one or more blanks, requiring a student to write target words or phrases.

Sentence frames scaffold writing for English learners, giving them a “starting place” and models of correct grammar usage and paragraph construction. Sentence frames lower the language barrier for English learners, helping them to express their ideas in writing.

Here is a math example for an English learner at the intermediate level that might be used during a learning task or assessment:

An equation is _____ that shows that _____
_____. Two examples of equations are:
(1) _____ and (2) _____.
Two non-examples are: (1) _____ and (2) _____.

Here is a science example for an English learner at the beginning level that might be used as part of lab notes or an assessment:

One tide pool animal is the _____. It eats _____.
This is its prey. _____ likes to eat it. This is its predator.

3. Concept Organizer. A concept organizer provides different ways for defining a key concept.

An index card for a key word or term is used with boxes for some of the following options: a definition and word form, characteristics, examples or synonyms, non-examples or antonyms, show sentences, or illustrations. Figure 3.3 presents a simple template of a concept organizer that is most useful for a noun.¹⁵ Choose the combination of boxes that best defines a term so that all diverse learners will understand. Examples contrasted with non-examples can be very effective, especially when students are presented successive pairs and develop their own definitions and thereby build their conceptual understanding.¹⁶ Then students write the final definition and some examples and non-examples on their index card. Including the word form (e.g., noun, verb, adjective) and a show sentence can help English learners understand how to use the word in a sentence.

Figure 3.3: Simple Concept Organizer

Word or Term (form)	Definition
Characteristics	Example(s)

The two examples on page 28 present variations in the format of a concept organizer. The math example reflects the Frayer Model¹⁷ and the science example¹⁸ includes all of the optional parts of a concept organizer.

15 See an explanation and examples in Gay, A.S. (2008, October). Helping teachers connect vocabulary and conceptual understanding. *Mathematics Teacher*, 102(3), 218–223.

See the idea for the three parts of a concept organizer in Henderson, K.B. (1970). Concepts. In M.K. Roszkopf (Ed.), *The teaching of secondary school mathematics, 1970 Yearbook of the National Council of Teachers of Mathematics (NCTM)* (pp.166–195). Washington, DC: NCTM.

Joyce, B.R., Weil, M., & Calhoun, E. (2004). *Models of teaching* (7th ed). Boston: Allyn and Bacon.

16 See Gay and Joyce et al. citations in footnote 12.

17 Adapted from Ontario Association for Mathematics Education. *Think literacy: Cross-curricular approaches, grades 7–12*. Accessed 6 October 2008, <<http://oame.on.ca/main/files/thinklit/FrayerModel.pdf>>.

Frayer Model applied to content areas is also discussed in Greenwood, S.C. (2002). Making words matter: Vocabulary study in the content areas. *The Clearing House*, 75(5), 258–263.

18 The example of invertebrate is used with permission from WestEd. Source is Carr, J., Sexton, U., & Lagunoff, R. (2007). *Making science accessible to English learners: A guidebook for teachers*. San Francisco: WestEd.

Figure 3.4: Example of Math Concept Organizer, Frayer Model

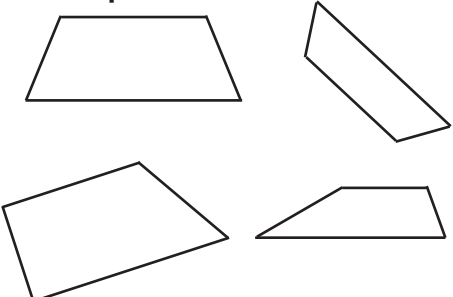
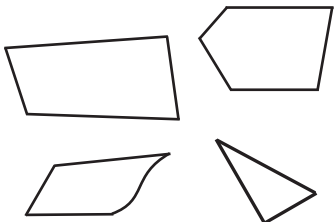

<p>Definition</p> <p>A trapezoid is a quadrilateral with one pair of parallel sides.</p>	<p>Facts/Characteristics</p> <p>Four straight sides. Two opposite sides are parallel. May have 0 or 2 right angles. Non-parallel sides may have equal length.</p>
<div style="text-align: center; border: 1px solid black; border-radius: 50%; width: fit-content; margin: 0 auto; padding: 5px;">TRAPEZOID</div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p>Examples</p>  </div> <div style="text-align: center;"> <p>Non-examples</p>  </div> </div>	

Figure 3.5: Example of Science Concept Organizer

Invertebrate , n. (or adj.)	
Prefix and meaning: in- not, without	Root: vertebra
Synonym: spineless	
Characteristics: No vertebrate bones or spinal column Insect or marine animal	Definition: animal having no spinal column
Examples: snail, worm, ant, jellyfish, shrimp	Non-examples: lizard, fish
Showing sentence: Invertebrates are animals that have no backbone.	
Illustration:  worm	

Adapted from *Making Science Accessible to English Learners: A Guidebook for Teachers*. © 2007 WestEd.

Section 4.

Scaffolding Strategies to Teach Content

Construction workers use scaffolds temporarily during the construction of a building to support a wall or to easily access different levels of a building. Similarly, teachers can use certain instructional strategies to scaffold learning for English learners until they no longer need such support to access the curriculum in content areas.

This section provides an explanation of how to scaffold reading materials, followed by a description of four strategies to scaffold content reading.

The sample lesson plans in Section 6 include examples of integrating scaffolding strategies for English learners into science and math content lessons.

Scaffolding Reading Materials

English learners below the early fluent level may have difficulties independently reading a science or math textbook. A recommendation is to assign reading a section of a textbook after direct instruction to reinforce what was presented, rather than at the start of a lesson when introducing new concepts. Generally, it is too much to expect English learners to read and comprehend a section of the textbook as part of introducing new concepts.

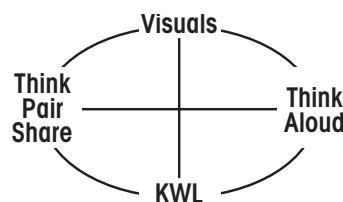
Math and science teachers can heighten reading comprehension of textbook passages for English learners by:

- Front-loading key vocabulary from the textbook (i.e., introducing key terms during a lesson) before students are expected to read the textbook;
- Annotating textbook excerpts by highlighting key words, defining or clarifying key concepts with notes in the margin, or adding illustrations;
- Assigning English learners at the intermediate and lower levels alternative texts on the same class topic but at their readability levels (especially for science textbooks) — materials at one or two lower grade levels may suffice;
- Providing an advance organizer and meaningful questions to alert students to specific information they are expected to understand from reading the textbook; and
- Mixing reading and language ability levels and having small groups (perhaps as small as pairs or triads) read collaboratively and answer questions; alternatively, having students in a group read the texts at their readability level and then discuss common concepts and additional information contained in higher level texts.

Four Strategies to Scaffold Content Learning

Presented below are four instructional strategies that are effective for all students. As depicted in Figure 4.1, they can be integrated as a unified approach to teaching, and they can be used throughout a unit lesson to develop students' conceptual understanding. Over time, teachers can add other strategies, keeping some practices routine so students can concentrate on the content rather than the procedure, and varying other practices to keep instruction “fresh” for students. The four strategies are Visuals, Think Aloud, KWL+, and Think-Pair-Share.

Figure 4.1: Scaffolding Strategies



1. Visuals. Visuals include nonlinguistic representations (e.g., photos, models, realia) and graphic organizers¹⁹ that visually represent the relationships among ideas.

Forming mental pictures of concepts and their relationships lowers the language barrier for English learners to learn, remember, and express complex, interrelated ideas. Visuals can be embedded in Word Walls, concept organizers, KWL+ charts (see the third strategy below), and student notes; they can be visual points of reference during Think Aloud and Think-Pair-Share activities.

GRAPHIC ORGANIZERS

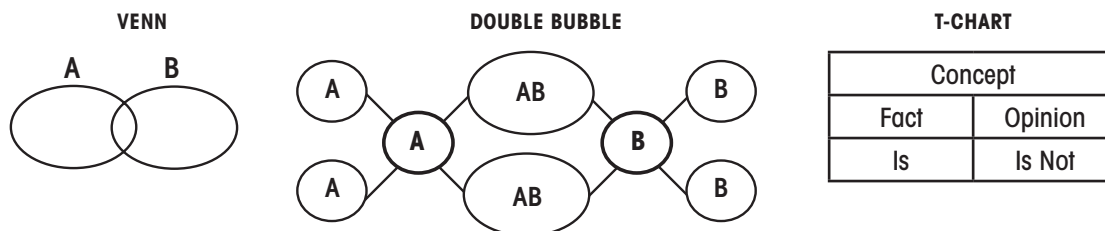
During learning, graphic organizers combine visual representation with oral discussion, helping English learners connect concepts. During assessment, graphic organizers help English learners show and communicate what they understand as an alternative to or in support of a long, complex, oral or written response. Graphs (line and bar charts) in mathematics can be considered special forms of graphic organizers.

Do *not* wait until the end of a lesson to introduce a graphic organizer — rather, build on it throughout the lesson and use it at the end to summarize what was learned. It can be effective to introduce the graphic organizer, perhaps with much of it blank, as an advance organizer at the start of a lesson. During the lesson, have students enter key terms into their graphic organizer in pencil. Sometimes the structure and terms in the graphic organizer should be the same for all students; in other instances, there can be variations, reflecting “different ways of knowing” or alternative perceptions or interpretations of phenomena or solutions to problems.

A Venn diagram, Double-Bubble, and T-chart are used to visualize the comparing and contrasting of information. The Venn diagram is well known for showing common characteristics in the intersection of two circles and unique characteristics in the A or B circles. The Double-Bubble is a more recent option that allows more complexity or space (bubbles) for more characteristics regarding what is or is not a common or unique characteristic. The T-chart is used to contrast information about a concept.

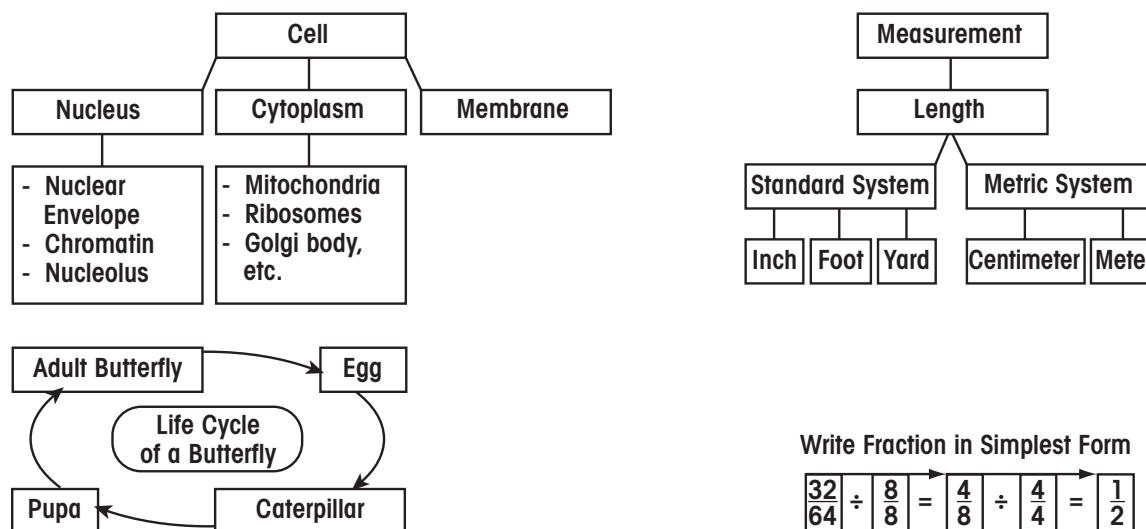
¹⁹ There is a wealth of graphic organizers that can be found in textbooks and on the Internet. One particular website is thinkingmaps.com, which presents eight graphic organizers according to eight distinct ways that people think about information and problems and solutions.

Figure 4.2: Venn, Web, and T-chart Organizers



A hierarchy web is commonly used in science for organizing and categorizing information. A sequence or cycle of events may be useful in math or science. Examples are shown in Figure 4.3.

Figure 4.3: Hierarchy and Sequence Organizers



Write Fraction in Simplest Form

$$\frac{32}{64} \div \frac{8}{8} = \frac{4}{8} \div \frac{4}{4} = \frac{1}{2}$$

2. Think Aloud. The teacher verbalizes his or her own thought processes while reading aloud, showing a video, or conducting an experiment, etc.

The teacher uses Think Alouds to make scientific or mathematical thinking transparent to students. Think Alouds are used to teach comprehension skills, scaffold reading of difficult text, or model thought processes in an investigation or exploration (i.e., during inquiry-based instruction). Think Alouds can be used to make explicit connections between text and visual concepts and/or express association (e.g., sequential order, task context and appropriate solutions, or cause and effect).

During the Think Aloud, the teacher may emphasize key vocabulary by saying the words slightly louder and then briefly pausing, and pointing to the vocabulary on a Word Wall if possible. Think Aloud is essential when the teacher creates a graphic organizer or models a procedure.

The teacher may use sentence starters such as “I think that,” “I know that,” or “I predict that.” These sentence starters can be planned so that they serve as models for sentence frames that students will be expected to use orally or in writing later in the lesson.

Think Alouds can be supported by visuals and embedded in KWL+ and Think-Pair-Share activities.

3. Think-Pair-Share. The teacher poses an open-ended question and gives students one or two minutes to think; student pairs (or triads) discuss their ideas, and then pairs share ideas with a larger group or the whole class.

To avoid particular students dominating a discussion, the teacher may want to designate speaker/listener/responder roles and set time limits. This strategy can be used to apply academic vocabulary and newly learned concepts. For example, during data analysis, students analyze a chart or graph and pair-share their interpretations (e.g., “I think this graph means that...”). Students may reference visuals to recall vocabulary and concepts quickly, before or as they speak. The teacher’s Think Aloud can serve as a model for students to express their thinking during this activity. This strategy lowers student anxiety about orally saying what they think, and it involves all students in contributing to a whole class discussion and summary of ideas.

4. KWL+. The teacher starts a lesson by recording students’ responses on a three-column chart (see Figure 4.4) to questions about what they already know (K) and what they want to know (W). At the end of the lesson, the teacher records what has been learned (L). The “+” aspect of KWL+ refers to the final step of making connections among the three categories of information.

Figure 4.4: KWL+ Chart

K	W	L

Eliciting from students what they know and want to know, and then what they have learned about a topic serves to get students ready to construct new knowledge, build interest in the topic, and consolidate what they are learning. Student responses help the teacher adjust the lesson to fit students’ needs, preconceptions, misconceptions, and interests. The KWL+ chart can be used to predict, inquire, review, and summarize.

During a Think Aloud when reviewing a completed KWL+ chart, the teacher can make connections to key vocabulary on an existing Word Wall or in concept organizers (see previous discussion of these two tools in the section on teaching academic vocabulary). Visuals can be part of or a point of reference as information in the KWL+ chart is constructed or reviewed. Think-Pair-Share is a good way to lower student anxiety about speaking in front of the class and to involve all students in suggesting questions and information to add to the KWL+ chart.

Scaffolding and Differentiated Instruction

Providing scaffolds according to English learners' ELD levels (see Section 2) is a form of differentiated instruction. Differentiated instruction does not have to mean planning individualized lessons for each student in the classroom. Differentiated instruction does mean using a variety of strategies that address the diverse learning needs of students in the classroom. For example, a graphic organizer can benefit English learners at all ELD levels as well as the more visual and spatial learners when it accompanies oral instruction. A teacher can create sentence frames appropriate for English learners at two or three ELD levels, and this writing scaffold provides more targeted differentiation for English learners. Combining the use of a variety of research-based instructional strategies has the potential of meeting the learning needs of a wide variety of students.

This outline of a differentiated lesson plan²⁰ over several days is an example of how a teacher might reasonably plan scaffolding strategies for English learners. This plan is for a high school science lesson. A differentiated math lesson plan may be simpler than this. The conceptual flow of activities is reflected in the engage through elaboration stages.

In part A, scaffolding strategies are planned for the whole class, considering all students to be diverse learners. Notice that strategies continue through many or all of the five stages (the 5 Es). In part B, three scaffolding strategies — text materials, sentence frames, and a graphic organizer — are modified to differentiate for English learners at three levels (beginning through intermediate), as informed by the ALS chart for grades 9–12. The strategies in the leftmost column of parts A and B are described in Sections 3 and 4.

PART A

High School Physical Science Outline for Density and Buoyancy Lesson: Scaffolds for ELs				
Scaffolding Strategies	Overarching Question: How does density relate to buoyancy?			
	Engage	Explore	Explain	Elaborate
	Floating Puzzles	Mass & Floating How Heavy?	Reading: What is Density?	Internet search; news clippings
	Evaluate: Hand gestures, white boards, lab notes; L of KWL chart. Quizzes: study guide, accommodations for Intermediate and lower ELs			
Enhanced Word Wall	From advance organizer	Add words; informally define	Formally define; use in student talk	Use in writing
Concept Organizer		Key words on ring of index cards	Organize cards; use in reading & writing	Use; add to ring cards
Sentence Frames		Template for lab notes; wall callouts	Template for reading notes	
Graphic Organizer Visuals/Realia	Circle Map Video clip	Add to Circle Map Lab materials	Flow Map	Multiflow Map
Think Aloud		Guide thinking during activity	Model reading strategy	
KWL Chart	K–W		L	L
Think-Pair-Share	Brainstorm preconceptions		Summarize what was learned	

²⁰ For educators familiar with the SIOP lesson plan template, the outline in this guidebook fits into the “lesson sequence” section, providing columns for the 5 Es and rows for specific strategies.

Adapted from *Making Science Accessible to English Learners: A Guidebook for Teachers*. © 2007 WestEd.

PART B

Modified Strategies by ALS Levels			
	Beginning/Advanced Beginning	Intermediate	Early Fluent/Fluent
Scaffolding Strategies	Heterogeneous grouping for all activities except reading texts		
Reading and Media Materials	Leveled text with support; notes with sentence frames	Leveled text; group read & take notes	Textbook group read & notes
		Groups share information; revise notes	
Enhanced Word Wall			
Concept Organizer			
Sentence Frames	Identify key concepts	Describe key concepts	Explain, infer, generalize
Graphic Organizer	Identify key ideas	Some supporting details	All critical details
Think Aloud			
KWL Chart			
Think-Pair-Share	Heterogeneous groups	Heterogeneous groups	Heterogeneous groups

Section 5.

Assessing English Learners

This section discusses how to select, modify, and administer good classroom assessments that inform a teacher about English learners' true understanding of science or math content. English learners may need accommodations to lower the language barrier when they attempt to express what they have learned. The sample lesson plans in Section 6 include examples of assessing math and science content with accommodations for English learners.

This discussion is not about state tests; it is about teachers' ongoing and interim classroom assessments used to diagnose, plan lessons, adjust lessons, and grade students. There are two types of classroom assessments: formative assessment, which takes place during the instructional process; and summative assessment, which takes place at the end of a unit of study.

In a standards-based learning and assessment system, teachers should plan a unit lesson by *first* identifying classroom assessments that measure what students know and can do, and *then* designing the instructional strategies and student activities that allow students to learn the assessed skills and processes. Many of the accommodations used in assessing English learners are also powerful instructional strategies, so it makes sense to plan assessment *before* instruction in order to align the two — for example, to use a particular graphic organizer during instruction that will be used by students during a summative assessment.

Formative Classroom Assessment

Formative assessment involves informal and formal assessments administered during the learning process, not as part of the grading system, but to inform the teacher and student about progress in learning key concepts. Here are some tips for conducting informal formative assessments:

- Have students form small groups and explain a concept in their own words or in an alternative way (e.g., using pictures or cartoons).
- Have students who “got it” start on a critical thinking task in small groups while the teacher re-teaches a small group who did not “get it” the first time.
- Give a quiz or ask students to complete a quick-write in their journals about an idea they learned or found interesting, boring, or confusing. Read student responses in order to prepare the next day's lesson.

Formative assessment may be informal “checking for understanding”²¹ during the direct instruction phase of a lesson. Two popular techniques are described below.

- **Thumb signals.** Students use their thumb position close to their chests to indicate agreement (thumb up), disagreement (thumb down or sideways), or “don’t know” (flat hand or fist) concerning a question or statement posed by the teacher or a student. The teacher can quickly scan student responses and continue direct instruction, immediately adjusting the lesson according to student responses.
- **Whiteboards.** Using whiteboards, students can either respond to multiple-choice questions (e.g., a, b, c, or d) or create brief answers. When the teacher says, “Show me,” students hold up their whiteboards. Again, the teacher can immediately adjust the lesson according to student responses.
- **Open-ended comprehension questions**, such as:
 - Who can tell me the directions for your small group task?
 - How do you get 32? What strategy did you use?
 - What can you tell me about an invertebrate?

Summative Classroom Assessment

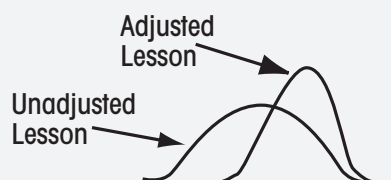
Summative classroom assessment involves administering an assessment to students at the end of a unit of study, for example, an end-of-unit test or end-of-course test. Each student must complete the assessment independently so that a teacher can accurately gauge what each student truly has learned; group work generally is higher quality than what any individual in the group could produce independently.

Three common testing formats — multiple-choice tests, written short answer and performance tasks, and oral presentations — can present language barriers for English learners to communicate what they really do know.

21 Fisher, D., & Frey, N. (2007). *Checking for understanding*. Alexandria, VA: Association for Supervision and Curriculum Development.

Numerous research studies²² conclude that adjusting instruction based on student feedback is a very powerful teaching strategy. Figure 5.1 to the right illustrates this point. A lecture-style lesson followed by a summative test typically produces a bell-shaped distribution of test scores, whereas a lesson adjusted to fit students' progressive understanding produces a narrower distribution with more students near mastery.

Figure 5.1: Formative Assessment Results



Multiple-choice tests. Even though English learners can easily bubble in a response choice, they may have difficulty understanding the test directions and item stem so that the response choice reflects actual understanding rather than guessing. Here are three aspects of a multiple-choice test that can frustrate the English learner:

- The directions for each set of items are terse, and sometimes students are asked to select the best answer. Does the English learner understand the difference between good, better, and best, and that “best” in this context means that only one choice is the “most correct?”
- Each item contains a stem followed by several response choices. The item stem is written succinctly and so it lacks the rich context and rephrasing that English learners often need.
- The English learner may not understand the complete meaning of the item stem, translate what is understood into his primary language, and then try to hold that “partial idea” in memory while translating and linking each response choice.

Short-answer tests and written performance tasks. Open response items can present language barriers when the English learner must express his or her answers clearly in writing.

Oral presentations. Standing up to speak in front of the whole class can raise the anxiety of English learners, especially those at the Beginning and Advanced Beginning levels because they know they cannot yet orally express their ideas in the same way as more English proficient students.

22 Black, P., & Wiliam, D. (1998). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, 80(2), 139–149.

Bloom, B. (1984). The search for methods of group instruction as effective as one-to-one tutoring. *Educational Leadership*, 41(8), 4–17.

Assessment Strategies

Below is a chart summarizing some scaffolding strategies that may allow English learners an equal opportunity to communicate what they truly know by lowering the language barrier. Assessment experts call these strategies “accommodations.”

Strategies	Purpose or Use
Models, rubrics	Make the expected performance transparent to students. The teacher might involve students in creating student-friendly rubrics. Identifying models and rubrics before instruction assists the teacher in how to target exactly what student performance is expected and assists students as an advance organizer for what they are expected to learn.
Familiar key words	Select the assessment before starting instruction. Identify key words in the assessment. Ensure those key words are taught and used often during instruction so they are familiar during the assessment. ²³
List of key words	During formal assessments, notes and enhanced Word Wall might be put away (e.g., when the tests asks for definitions). However, students can be provided with a list of possible academic content and function words that might be used to answer questions orally or in writing.
Pictures	Encourage students to draw pictures or otherwise illustrate their answers before attaching words orally or in writing.
Graphic organizer	Students write words on a graphic organizer. They might also select a template that best fits the context. The teacher ensures that students are familiar with the use of the template during instruction.
Sentence frames	When students are required to write open-ended answers, the teacher provides sentence frames to scaffold their written communication of key ideas. The teacher might create several versions tailored to students’ writing proficiency levels. It may or may not be appropriate to expect English learners at the beginning language level to participate in this form of assessment.
Oral prompting	The teacher may orally prompt English learners for short answers separately from other students. A student might complete some combination of drawing pictures, filling in a graphic organizer, and writing answers in sentence frames before the teacher reviews the student’s work and then prompts for oral answers when written answers are unclear. Since English learners at higher language levels are expected to produce more in writing, oral prompting may be staggered with a beginner orally answering first and ending with an intermediate or early fluent student.

Notice that these assessment strategies are also effective instructional strategies, some of which were discussed in prior sections about teaching vocabulary and content. Hence, teachers need to plan the assessment before planning instruction. Knowing what is expected of all students in the assessment, and what scaffolding strategies will be used for English learners, teachers can plan their lessons to include those strategies during instruction. For example, students are familiar with a specific graphic organizer during assessment because it was used during instruction.

²³ Abedi found that simplifying the language of test items was the most effective accommodation for English learners. See Abedi, J. (2002, Spring). Assessment and accommodations of English language: Issues, concerns, and recommendations, in *NCA Commission on Accreditation and School Improvement Journal of School Improvement*, 3(1). Accessed 17 November 2008, <<http://www.icsac.org/jsi/2002v3i1/assessment>>.

Section 6.

Sample Lessons

Previous sections contained parts of the math and science sample lessons that are presented in full in this section. These are not models or full lesson plans. But they do embed the key ideas about using an ALS chart (Section 2), strategies to build and apply academic language (Section 3), strategies to assist learning content (Section 4), and strategies or accommodations to assist English learners when they attempt to communicate what they have learned on equitable classroom assessments (Section 5).

The scenarios that follow are a sample math lesson for Algebra 1 and a sample science lesson for a sixth grade life science class. Both classes have 35 students with two Advanced Beginner, five Intermediate, and three Early Fluent English learners. Ten of the English-only students struggle with grade-level reading or writing. Keep in mind that the reading and writing strategies for English learners may also benefit these English-only students who struggle with literacy skills, and the visual scaffolds can benefit all students who are primarily visual or spatial learners.

Algebra 1 Lesson

An Algebra 1 teacher reflects on how to plan a series of lessons that target a cohesive set of Idaho Objectives, using the grades 9–12 ALS chart to differentiate instruction for English learners. This example²⁴ is one part of her lesson plan showing how she uses the ALS chart to differentiate instruction for several levels of English learners.

In order to develop a greater understanding of using linear equations and graphs to predict outcomes, I select the following objectives from the Idaho standard, Concepts and Language of Algebra and Functions:

- 9.M.3.1.1 Represent mathematical relationships using variables, expressions, linear equations, and inequalities.
- 9.M.3.2.1 Use appropriate procedures for manipulating and simplifying algebraic expressions involving variables, integers, and rational numbers.
- 9.M.3.3.1 Use appropriate procedures to solve multi-step, first-degree equations and inequalities, such as $3(2x - 5) = 5x + 7$ or $3(2x - 5) > 5x + 7$.

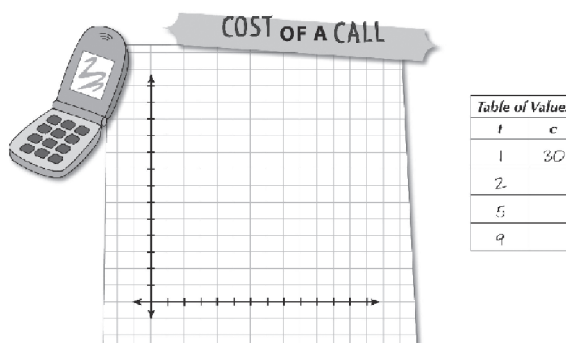
²⁴ The graphic in Figure 6.1 and task of graphing the cost of cell phone charges appears in the Coordinate Plane module (in press) of Aim for Algebra program. Accessed 22 October 2008, < <http://www.its-about-time.com/aim/aim.html>>, and is adapted with permission of It's About Time.

- 9.M.3.4.1 Use appropriate procedures to solve linear systems of equations involving two variables, such as $x + y = 7$ and $2x + 3y = 21$.
- 9.M.3.5.1 Given graphs, charts, ordered pairs, mappings, or equations, determine whether a relation is a function.
- 9.M.3.5.2 Evaluate functions written in functional notation.
- 9.M.3.5.3 Given a function, identify domain and range.
- 9.M.3.6.1 Model and solve real-world phenomena using multi-step, first degree, single variable equations and inequalities, linear equations, and two-variable linear systems of equations.
- 9.M.3.6.2 Use graphs and sequences to represent and solve problems.

I consider the key concepts, tasks, and skills that may be required of my students specifically, communicating their understanding about solving problems and making predictions from data graphed on a coordinate plane. I also consider the kinds of experiences and activities that will engage all students and develop their academic language.

Students will have to predict cell phone charges for calls of different lengths by following directions to graph an equation based on ordered pairs in a table. Students will work independently, except English learners at the Advanced Beginner level (and any Intermediate English learners having difficulty) who will work in pairs with a more English fluent student. Students will show their work and orally answer questions to show their understanding; my English learners will use language appropriate to their level.

Figure 6.1: Graphing Costs of Cell Phone Calls



I will add new words to the Word Wall chart, using sentence strips with informal definitions and pictures during the K part of the KWL+ activity. I tell students that I expect them to use these key words as they talk with partners and me during the activity. I will use Think-Pair-Share during KWL+, and during and at the conclusion of the activity to encourage all students to participate and contribute ideas using key vocabulary. (See Section 3 for more on steps and strategies for teaching vocabulary to English learners.)

I will use Think-Pair-Share as we complete a KWL+ chart to encourage all students to participate in offering what they already know at the start of the lesson (K), what they want to know to complete the task (W), and what they learned by the conclusion of the lesson (L). (See Section 4 for more on scaffolding academic content for English learners.)

After planning my general instructional strategies for the whole class, I refer to the grades 9–12 Academic Language Skills (ALS) chart to consider how strategies will need to be tailored to fit my English learners. Looking at the ALS chart, the worksheet students will complete, and instructional strategies I plan to use, I see that I can combine my Advanced Beginner and Intermediate English learners for Listening with Comprehension and Use Academic Language. The level of note taking on the worksheet is appropriate for all students. For Reading with Comprehension, my Advanced Beginners may or may not need some assistance with directions on the worksheet. Last, I know that the visual scaffolds I will plan for my English learners will also benefit the English only students who are predominantly visual learners.

The chart below shows my simplification of the ALS chart for this lesson.

Figure 6.2: Example of ALS Chart Applied to Math Lesson

Example of Grades 6–8 ALS Chart Applied to a Math Lesson			
AL Skills	Advanced Beginner	Intermediate	Early Fluent
Listen with Comprehension	Directions are bullet items in simple language on each student's worksheet. Orally review each step with students, checking for comprehension.		Can use the same work sheet as English only students.
Use Academic Language	Word Wall (base charge, per, graph, scale, equation, predict, label, horizontal, vertical, c-axis, ordered pairs); review old and introduce new words during K of KWL chart. Use key words with a partner or me during the task and whole class discussion. Expect brief, simple answers.		Use expanded vocabulary to express complex ideas. Use word parts, glossary, and dictionary to define new words.
Ask and Answer Questions	Orally ask and briefly answer factual questions about the problem and solution.	Orally ask and answer factual questions about the problem and solution.	Ask and answer any analytical and prediction questions.
Take Notes	Complete the worksheet per directions (very little writing is required, so all students can do this).		
Read with Comprehension	With assistance, read and follow the directions on the worksheet.	Read and follow the directions on the worksheet.	

Looking at Listen with Comprehension skills in the chart, I decide to review familiar key words as part of a KWL activity, supported by a Word Wall about graphs, when I relate the concept of “base and additional charges” to their own experiences (e.g., admission to a movie and food or drinks). Then I will orally review the bulleted directions on their worksheets, pointing to a worksheet transparency projected on the wall, checking for understanding for my Advanced Beginner and perhaps Intermediate English learners. Written directions are simple sentences for my Advanced Beginner and Intermediate students. (See Section 2 for more on incorporating the use of ALS charts in lesson planning.)

In conclusion, I am essentially planning one unified lesson concerning solving problems and making predictions from data graphed on a coordinate plane that all students are expected to learn. I

am not creating a lesson plan for each group of English learners as well as other students. Rather, I am differentiating my lesson by using many visuals, KWL+, and Think-Pair-Share activities to reinforce concepts and apply academic vocabulary. Very little writing is required to complete the worksheet, so this can be done by all students in my class.

Sixth Grade Science Lesson

A teacher reflects on the strategies she will use in her sixth grade class to differentiate instruction and assessment for her English learners for a unit lesson, a series of lessons with an overarching theme about the human body as a system.

In order to develop a greater understanding of systems' thinking, geared to the human organism as a system, I selected the following objectives from the Life Science and Nature of Science Standards:

- 6.S.1.1.1 Analyze different systems.
- 6.S.1.2.3 Use models to explain or demonstrate a concept.
- 6.S.1.5.1 Analyze how the shape or form of an object or system is frequently related to its use and/or function.
- 6.S.1.6.3 Select and use appropriate tools and techniques to gather and display data.
- 6.S.1.6.6 Communicate scientific procedures and explanations.
- 6.S.3.3.1 Identify the different structural levels of which an organism is comprised (cells, tissues, organs, organ systems, and organisms).

The Life Science objective (6.S.3.3.1) and related Nature of Science objectives guide my lesson planning. I consider the key concepts, tasks, and skills that may be required of my students; how they will communicate their understanding about different systems and the relationship to organisms; and the kinds of experiences and activities that will engage all students and develop their academic language.

My lesson will include direct instruction, small group tasks along with discussion and taking notes, and whole group discussion. Students will have to consider how the shape, form, behavior, structure, and function of each of the elements in a system work together to make a whole system. They will have to analyze a system and communicate scientific procedures and explanations to show their understanding; my English learners will do this in a way that is appropriate to their language level.

I will add key academic vocabulary words and informally define them using pictures, synonyms, or brief, simple descriptions on the Word Wall+. Words can be added and definitions can be refined as we move through the series of lessons about my model of a house, their familiar system, and the human organism. Students will maintain a personal glossary (part of homework), and apply academic vocabulary orally and in writing. (See Section 3 for more on steps and strategies for teaching vocabulary to English learners.)

The main visuals I plan to use, besides a Word Wall, are a T-chart, KWL+, and poster with a graphic organizer depicting flow and causal relationships.²⁵ The T-chart will have three columns for my model of a house as a system, groups' familiar system, and groups' human organism as a system, and rows as a hierarchy of parts (see the T-chart below). I will write students' responses on a KWL+ chart. I will use Think-Pair-Share during KWL+ to encourage responses and practice using key vocabulary. I will "think aloud" as I produce a house system in graphic organizer format on poster paper as a model for students to produce their own posters of a living organism system. (See Section 4 for more on scaffolding academic content for English learners.)

Figure 6.3: Example of T-chart

House as a System	Living Organism — System
Lego piece (brick)	Cell
Wall	Tissue
A room	Organ
Plumbing, heating/cooling	Organ system
House	Body system
Neighborhood, climate	Human in its environment

After planning my general instructional strategies for the whole class, I refer to the grades 6–8 Academic Language Skills (ALS) chart to consider how strategies will need to be tailored to fit my English learners. I focus on my instructional strategies and students' learning activities, and what I can expect from my students to show their understanding. The chart on page 47 shows some of my ideas for this lesson on the human organism as a system.

²⁵ The Institute for Systems Biology offers an example using a cell phone network and software program called Cytoscape in an article by Ludwig, C., & Baliga, N.S. (2008, Summer) Systems concepts effectively taught using systems practices, in *Science Scope*, 31 (9), National Science Teachers Association. Article can be downloaded for free at <http://www.nsta.org/> and search for Science Scope.

Figure 6.4: Example of ALS Chart for Science Lesson

Example of Grades 6–8 ALS Chart Applied to a Science Lesson			
AL Skills	Advanced Beginner	Intermediate	Early Fluent
Listen with Comprehension	Follow simple two-step oral directions with visuals.	Follow simple multi-step oral directions.	Follow multi-step directions.
Use Academic Language	Use some key words from Word Wall during Think-Pair-Share and small group tasks.	Use key words from Word Wall, KWL+, and texts during Think-Pair-Share, small group tasks, and whole class discussion.	Use expanded vocabulary to express complex ideas. Use word parts, glossary, and dictionary to define new words.
Ask and Answer Questions	Orally ask and answer factual questions about my simple model (with me or a partner), and about their system.	Same as Advanced Beginner, and make a simple inference about the group's familiar and human systems.	Ask and answer any analytical and inferential questions about the familiar and human systems.
Take Notes	Complete a T-chart using phrases in a group to identify parts of a system, given my model, during the investigation task.	Complete a T-chart and template with sentence starters during the investigation (basic system analysis).	Complete a T-chart template to take detailed notes during the investigation (complex system analysis).
Read with Comprehension	Read content of KWL+. Read Scholastic (grade 2) "The Digestive System." Contribute ideas in small group.	Read Scholastic (grade 4) "The Circulatory System." Contribute in small group to ideas about body system.	Read textbook on organism systems. Consolidate information from various texts into group summary.
Writing Strategies	Help organize basic facts in the group posters.	Help organize facts and details in the group posters.	Coordinate key facts and add complex information in the group posters.
Write Reports	Contribute to group poster by illustrating and labeling. Complete sentence frames about the human system.	Contribute to group poster. Write a brief report using a template that includes a simple inference.	Coordinate work on group poster. Write a longer report using a template that includes explanations and inferences.

In the Listen with Comprehension skills row, it shows that I will present a list of directions for two complex tasks that students will do in small groups (explaining a familiar system; explaining the human organism as a system). Directions will be simple sentences with pictures for my Advanced Beginner and Intermediate students, and more complex written directions will be given to students at higher language levels. To check for understanding, I expect students to be able to restate directions for a procedure.

I will prepare writing templates with two sets of sentence frames for taking notes and writing reports. For the Advanced Beginner level, students will fill in words, phrases, or complete a simple sentence. For the Intermediate level, students will have sentence frames that start the target idea and function words that help students relate ideas (e.g., "similarly," "however," "because," "as a result of"). (See Section 2

for more about function words and incorporating the use of ALS charts in lesson planning.) Here are a few examples of sentence frames I will use with my Advanced Beginner students:

A system is made of _____(parts)

The parts of a system work _____(together).

My example of a whole system is a(n) _____.

The parts of this system are _____, _____, _____
and _____.

One part, _____, *(name of it)* is connected to _____
because it _____. *(Action or how it helps,*
transports, changes or modifies.)

In conclusion, I am essentially planning one enhanced lesson concerning the human organism as a system that all students are expected to learn. I am not creating a lesson plan for each group of English learners as well as other students. Rather, I am differentiating my lesson by using many visuals, putting students in small groups, adding two reading texts at lower reading levels (about the same general topic because the textbook is too difficult to read for many students), and creating templates to help my English learners take notes and write a report. I will monitor students as they work on tasks and ask comprehension questions to check their understanding of procedures and concepts.

